INSTALLATION MANUAL

ELECTRIPISTONS

DIRECT THRUST DESIGNS LTD

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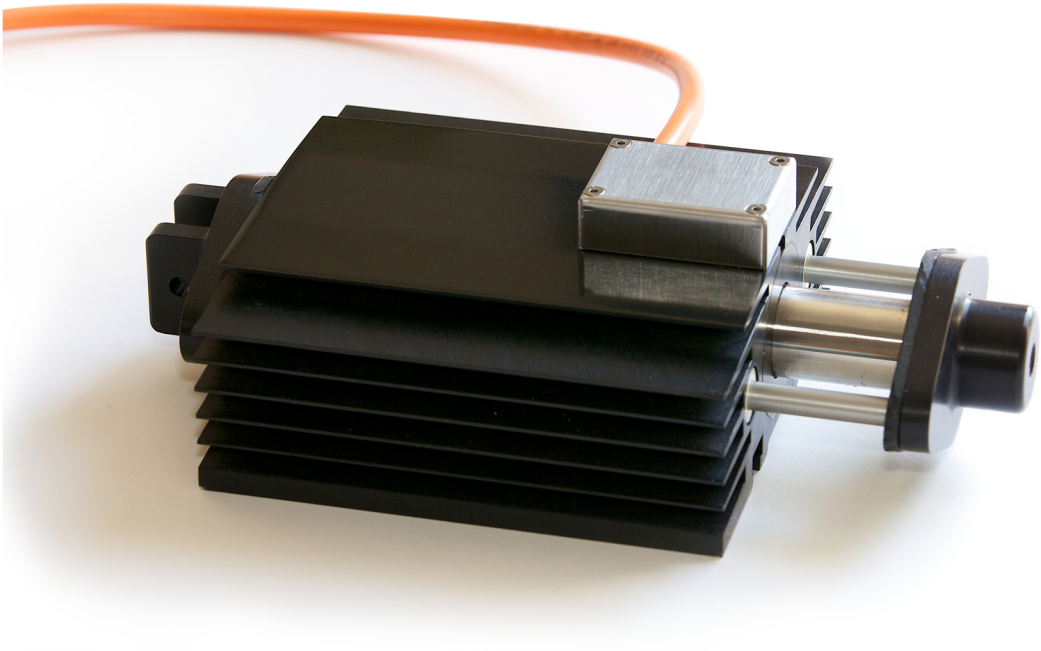


Contents:

1) Mechanical Installation

2) Linking Electropiston to payload

3) Duty cycles and pull / push forces

4) Maintenance / bearings

5) Electrical connections

6) Safety

Section 1:
Mechanical Installation

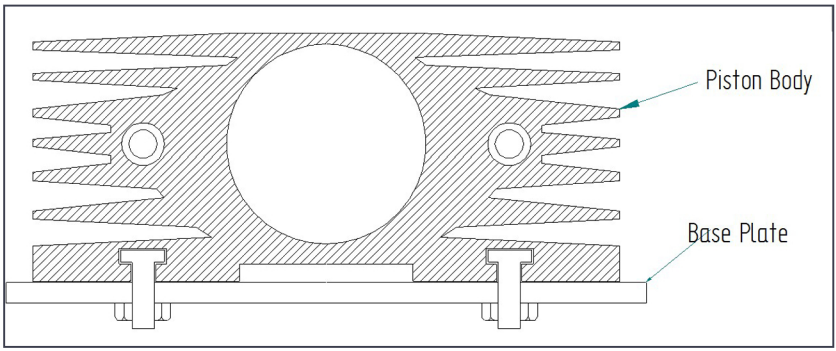
Handling safety:

The pistons contain permanent magnets. To avoid damage to the unit, or injury to the installer,
do not bring any ferromagnetic objects, ie screwdrivers etc. close to the moving rod.

Mounting the Electropiston:

The piston block is mounted by bolt heads in the parallel channels running along the base of the unit. Refer to data sheets (http://directthrust.co.uk/downloads.html) for bolt head and channel dimensions. Where possible, at least four bolts should be used at the corners of the underside. For optimum performance, the unit must be affixed to a mounting surface with good heat conductivity.

Fig 1.a:

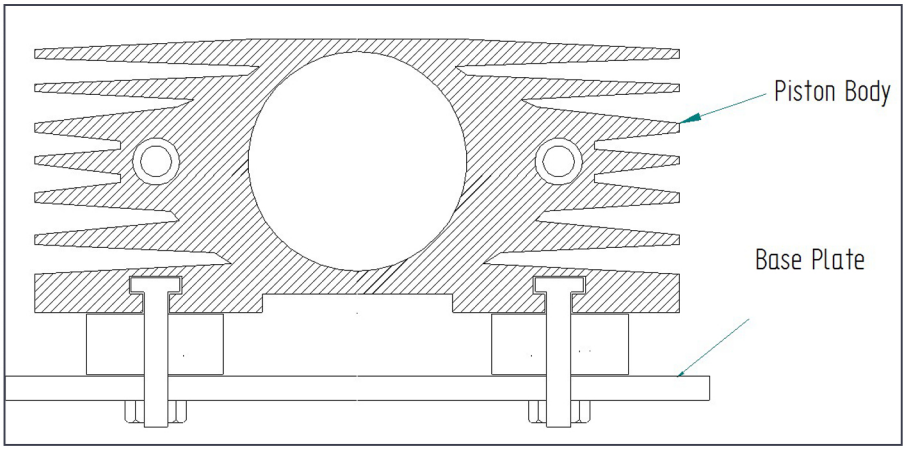


Section 1:
Mechanical Installation

The moving component of the E-Piston contains permanent magnets. To avoid any magnetic attraction between the body of the piston and the mounting surface, it is **strongly recommended** that the piston is mounted onto a non-magnetic base such as aluminium, or stainless steel.

If it is not feasible to mount the unit onto a non-magnetic plate, and only a steel mounting plate is available, aluminium off-set blocks should still be used to raise the piston away from the steel plate.

Fig 1.b:



The recommended thicknesses of the offset blocks are:

Small: 10mm Medium: 15mm Huge: 20mm

Section 1:
Mechanical Installation

Orientation:

Wherever possible, use E-Pistons in the horizontal plane. They may certainly be used in the vertical plane, but additional care must be given to the user's end stops, to protect against over-heavy concussion upon the piston end plates, and also affecting the duty cycle (see Section 3).

Dust and debris:

As far as possible, protect the piston against dust and debris; both of which reduce bearing life.

Water / Damp:

Provided the connection box is kept dry, the pistons are not unduly affected by mild damp. It is advised however for safety to operate in dry conditions.

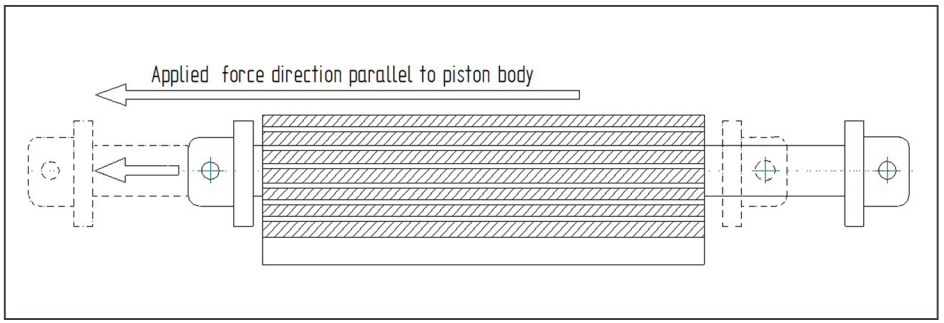
Connection leads:

Ensure the electric leads do not snag the moving end plates, and/or cannot chafe against any moving parts.

Section 2:
Linking the Electropiston to the payload

All standard E-Pistons are equipped with guide rods running in self-lubricating proprietary bearings.* This system has been designed to provide push/pull thrusts along the line of travel of the piston, ie parallel to the body of the piston.

Fig 2.a:



Therefore, the direction of thrust exerted on the payload must also be along the same axis as demonstrated in fig. 2.b and 2.c.

Section 2:
Linking the Electropiston to the payload

Fig 2.b:

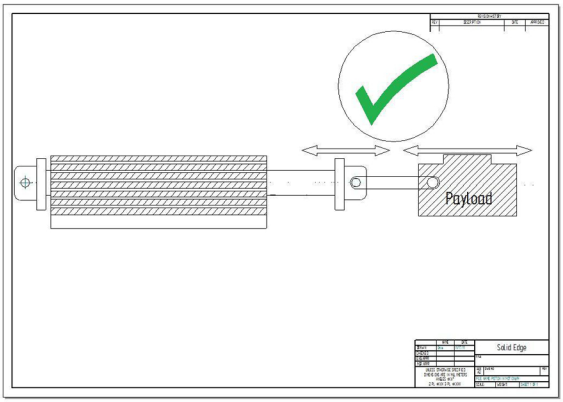
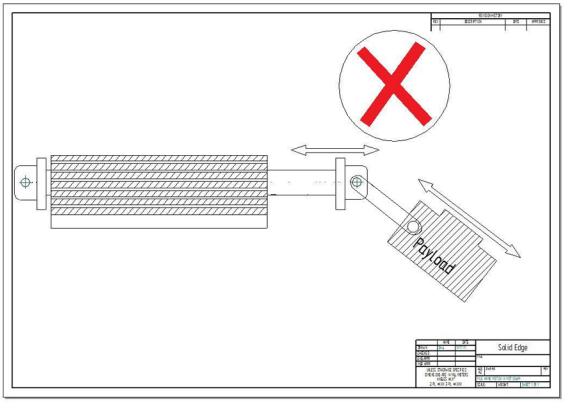


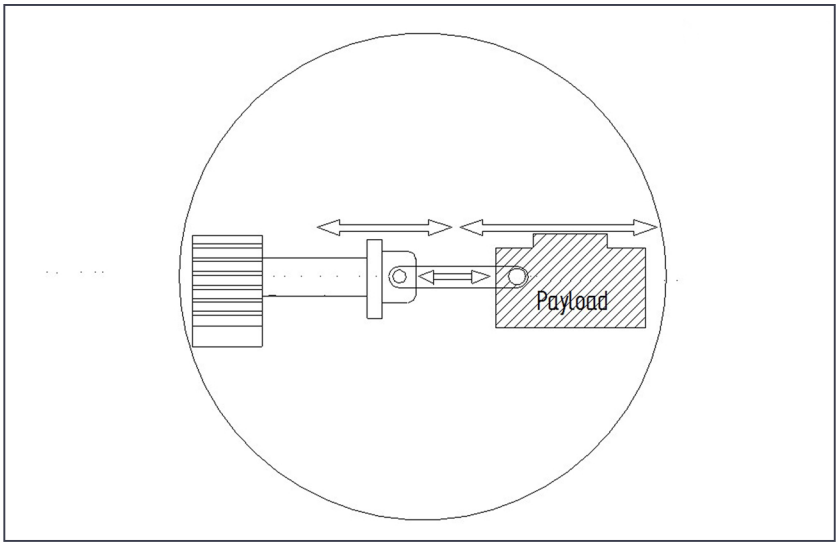
Fig 2.c



Section 2:
Linking the Electropiston to the payload

To avoid lateral forces being exerted on the bearings, the linkage to the payload should be loose, not rigid. An ideal solution is where a separate intermediary link is used as the method of transferring force.

Fig 2.c



Wherever possible, do not use the e -piston itself to limit the travel. The protective rubber buffers are only provided to prevent accidental direct metal to metal clashes at the end of travel. The travel should therefore be limited by the available movement of the payload such as to avoid the end plates taking the full shock.

* The units have each been life tested, in line and free running, to 10⊠ cycles, which equates to one stroke per second over a 16 hour shift, 5 days per week for 7 years.

Section 3: Duty cycles and push/pull forces

Duty cycles:

Unlike air pistons where the energy in the compressed air is supplied by a remote compressor, E-Pistons use electrical energy directly to create the required force. This results in a certain amount of heat dissipation, depending on the duty cycle. (Duty cycle in this context refers to the amount of time the unit is taking electrical current divided by the total time between successive operations.)

Examples:

If the unit is providing a modest force, for example half of its maximum rated thrust capacity, then in normal ambient temperatures, and with the correct heat sink, the duty cycle can usually be as high as 100%, ie continuous operation at that force. If it is required to provide its maximum rated force, then the duty cycle must be reduced, typically to 25%.

The user is advised to consult the tables of forces and duty cycles for each E-Piston type under the Product Performance Section on the product website (www.directthrust.co.uk)

Note, the available duty cycle is also affected by the air ambient temperature, and the degree of cooling available. If the E-Piston is mounted directly onto an aluminium or stainless steel base, the heat is largely conducted away through the base, enhancing the duty cycle by a factor of 1.5 to 1.7, depending on the model type. If this is insufficient, the body may be air cooled, again greatly enhancing the heat dissipation capability, from 2.7 to 3.0 times.

Always select an E-Piston with at least 20% spare capacity for the job.

Examples are also given on the product web site (www.directthrust.co.uk/)

Section 4:
Maintenance / bearings

General maintenance:

Other than occasional cleaning, no routine maintenance is required. Ensure that the guide rods are kept clean and occasionally wipe away any metallic
swarf that may have gathered on the E-Piston thrust rod. The mild adhesive Blu-Tak is ideal for this purpose. Under no circumstances permit sharp swarf to be attracted onto the thrust rod or other debris to enter the central air gap of the piston. Keep the general body clean, and do not permit ingress of moisture into the electrical connection chamber.

Ensure that the cooling fins are kept clear to enable free circulation of cooling air. They can be cleaned with a brush, or blasted clear of dust / debris with a compressed air gun. Ensure that any debris which is blasted clear does not settle on the guide rods or on the magnetic thrust rod

If the bearings appear to be unduly worn, meaning that the guide shafts are loose in their bearings and/or the air gap between the rod and the housing becomes asymmetrical, the unit, if not damaged in any other way, may be returned to Direct Thrust Designs Ltd for refurbishment.

Section 5:
Electrical Connections

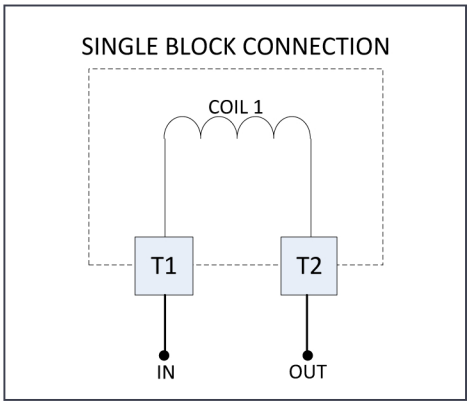
There are two types of connection box.

Type 1: Standard

The standard box contains just the electrical terminals to the motor coils, and the connections to a thermal cut-out sensor. In the case of the single coil units, the current is supplied on terminals T1 & T2. In the case of double coil units, the current is supplied on terminals T1 & T2 (coil 1) and T3 & T4 (coil 2).

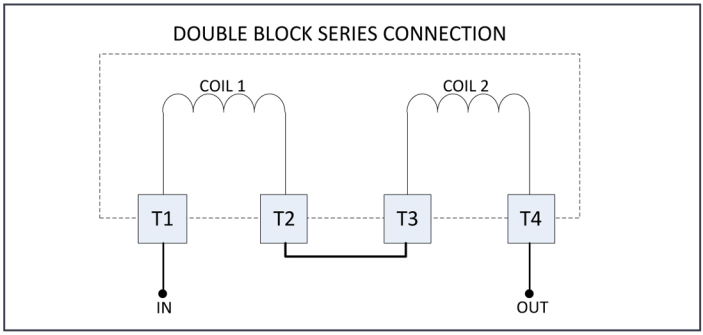
Very important. In each case, the "in" terminal is T1 for coil 1 and T3 for coil 2. (Therefore the out terminals are T2 and T4.)

For single block units, simply connect across T1 and T2



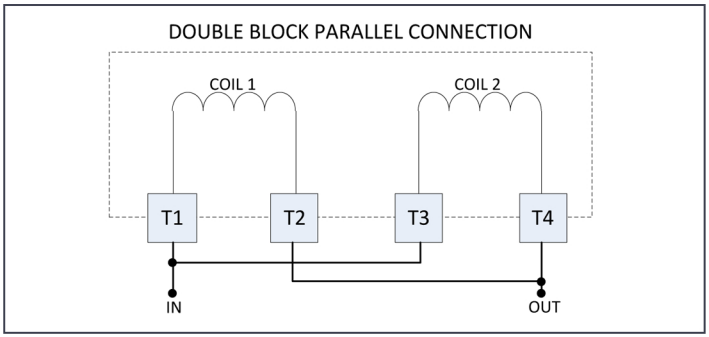
Section 5:
Electrical Connections

For double units. the coils can be connected in series:



In on T1 Connect T2-----T3 Out on T4 (same thrust, half the dissipation)

Or, for high thrust applications, in parallel:



In on T1 Connect T1-----T3 Connect T2------T4 Out on T2 (double thrust, double dissipation)

In either case, the total wattage must be within rating (see technical data sheets on www.directthrust.co.uk/datasheets)

Section 5:
Electrical Connections

The thermal cut-out is across T5 & T6. The cut-out opens when the coil safe operating temperature has been exceeded. In the case of low current E-Pistons, (small and medium ranges) the cut out can be connected directly in series with the supply, so that when the temperature is exceeded, the cut out automatically cuts off the supply to protect the piston.

cut out in series with the supply:

In on T5 (cut out) out on T6, then T6----T1 (as above)

For the heavy duty range, extra wiring from T5 & T6 (ie across the cut out) must be used to flag the over temperature condition to an external warning, control relay or similar.

Reversing the direction of travel using a double coil unit:

A convenient advantage of the electromagnetic design of the E-Piston is that for double coil units, rather than reversing the direction of current to change direction, it is possible to use one coil to drive the piston from (say) left to right, and the other coil, from right to left. This eliminates the need for a + feed for one direction and then a – feed for the opposite direction.

Left to right: Right to left:
In on T1 Out on T2 In on T4 Out on T3

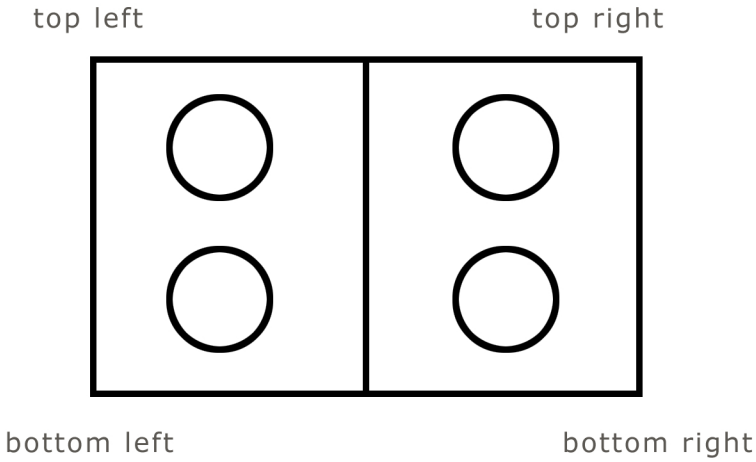
Obviously, the full thrust of using two coils together at once cannot be enjoyed, but this is a handy solution when polarity change is not feasible, and the required thrust levels are moderate.

Section 5:
Electrical Connections

Type 2: Molex:

For users preferring to use the Electronic Control Module, the alternative Type 2 connection box uses a Molex type connector for the power in/out, and a patch lead for the temperature sensor signals.

Molex connections:



Single coil units
Bottom left: Coil 1 in. Bottom right: Coil 1 out.

Double coil units:
Top left: Coil 2 in. Top right: Coil 2 out.
Bottom left: Coil 1 in. Bottom right: Coil 1 out

Section 5:
Electrical Connections

Series / Parallel:

In this case, it is not practical to connect the coils in series or parallel locally, and these connections must be made at the far end, following the principles of the Type 1 connection box explained above.

The patch lead thermal cut-out is across terminal 6 & 7 of the patch lead. In all cases when using the Molex type 2 connector, this must be used to control a remote warning device, and not be used in series with the supply.

Molex part numbers:

The plug which plugs into the Molex receptacle is:
Molex N987654321 (Radiospares: abcdef Farnell: ghijk)

The pins which go on the ends of the supply wires and push into this plug are:
Molex N123456789 (Radiospares: abcdef Farnell: ghijk)

[If using self-made wire connections, it is advised you follow the written procedures and use the correct tooling for making up these connections.]

Patch Lead:

The patch lead is a standard 11 pin lead, generally obtainable: (Radiospares: mnopq Farnell stuvx)

Connecting and using the E-Piston Electronic Control Module

Please refer to the Driver Unit manual for the standard leads available from Direct Thrust, or see data sheets on www.directthrust.co.uk/downloads.html

Section 6: Safety

Dismantling:

The central thrust rod contains powerful permanent magnets, and, if mishandled, these can cause self-damage and even personnel injury. Therefore dismantling is a specialist procedure, and should not be carried out on site unless under the specific guidance of Direct Thrust Designs Ltd technical personnel.

Keeping clear of magnetic equipment and media:

The same precautions apply to the use of steel tools and the like near the thrust rod. ALWAYS KEEP TOOLS CLEAR. They can be suddenly attracted onto the thrust rod surface. Avoid any two electropiston units getting close to one another. Ensure no magnetic media is placed close to the unit.

Powering up the unit:

Always disconnect the unit before handling / inspection. Never have fingers or hands in the path of travel of the thrust rod. The units are powerful and, like air pistons, can be immensely quick. Injury can occur if the rod shoots out unawares.

Earthing:

The units are designed for use up to the limit of the Low Voltage Directive. It is still an advised precaution to earth the body of the unit. This can be done via the mounting bolts, or by a dedicated earth lead connection to the body.

Section 6:
Safety

Disposal:

Exhausted units may be retuned to Direct Thrust Designs Ltd.

Thermal cutout:

For high duty applications, it is recommended the cut out be connected as described in Section 5.

electripistons are protected by granted and pending patents.